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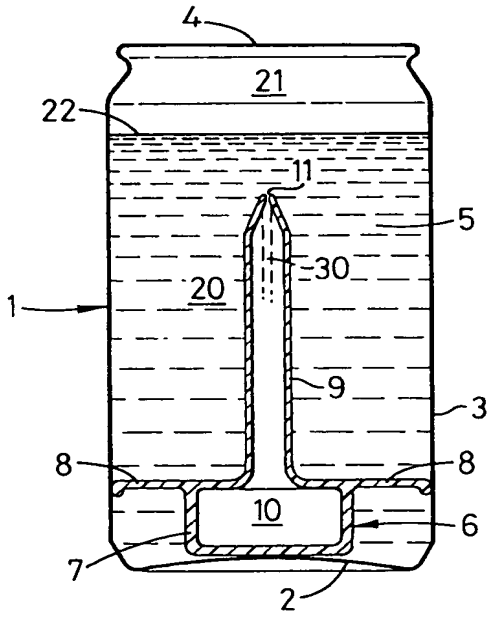
(54) Beverage package.

(57) A beverage package has a sealed can 1 having a chamber 5 containing beer 20 having gas in solution and forming a headspace 21 containing gas at pressure greater than atmospheric. A hollow insert 6 in the chamber 5 forms a secondary chamber 10 containing gas at pressure greater than atmospheric. The insert 6 is responsive to a pressure differential developed when the top 4 of the can 1 is opened to inject gas under pressure into the beer 20 through an aperture 11 at the top of an extension 9 of the insert. Said injection of gas liberates gas from solution in the beer 20 and the aperture 11 is located near to the surface of the beer 20 so that, preferably, less than 30% of the volume of the beer 20 is subjected to said gas liberation and adequate gas is maintained in solution in the beer 20 to provide "sparkle" from natural liberation of gas when the beer is poured into a drinking vessel.



EP 0 597 606 A1

TECHNICAL FIELD & BACKGROUND ART

The present invention relates to a beverage package and a method of forming such a package. More particularly it concerns beverages containing gas, such as carbon dioxide and/or nitrogen, in solution and packaged in a sealed container which, when opened for dispensing or consumption, causes gas to be evolved or liberated from the beverage to form, or assist in the formation of, a head of froth on the beverage. The beverages to which the invention relates may be alcoholic or non-alcoholic; primarily the invention was developed for fermented beverages such as ale, lager, stout or other beer and cider but may be applied with advantage to so-called soft drinks and beverages, or alcoholic drinks such as spirits, liquers, wine and the like.

Beverage packages are known which comprise a sealed container having a primary chamber containing the beverage having gas in solution and forming a primary headspace comprising gas at a pressure greater than atmospheric and in which a secondary chamber containing gas at a pressure greater than atmospheric has a restricted orifice which communicates with the beverage in the primary chamber. Upon opening the package to dispense the beverage, the primary headspace is opened to atmospheric pressure and this creates a pressure differential within the container which causes gas in the secondary chamber to be ejected by way of the restricted orifice into the beverage in the primary chamber. The ejection of the gas from the secondary chamber and through the restricted orifice causes gas in solution in the beverage to be evolved for froth formation. An example of a beverage package having the latter characteristics is disclosed in our British Patent No. 1,266,351 (where the gas ejection from the secondary chamber may be through a non-return valve).

In the known beverage packages of the kind discussed above the restricted orifice is located at or towards the bottom of the beverage in the primary chamber. When the package is opened and gas is ejected through the restricted orifice, gas in solution is initially evolved in the region of the beverage which is local to the restricted orifice and this evolution of gas develops or grows rapidly to rise or surge throughout the volume of beverage in the primary chamber to develop a head of froth which is retained when the beverage is dispensed from the container. For some beverages, particularly those containing carbon dioxide in solution (with or without nitrogen gas in solution) it is possible for a major part, if not all, of the gas in solution to be evolved from the beverage shortly after the gas has been ejected from the secondary chamber on opening the package. As a consequence, when the beverage is dispensed from the container into a drinking glass for consumption, it is possible that the absence, or low level, of gas in solution in the beverage will impart undesirable characteristics to the beverage (albeit that such beverage may have a good quality head of froth). This is particularly the case for so-called light beers or lagers where it is preferred that a reasonable volume of gas, usually carbon dioxide, is retained in solution in the beverage as dispensed in a drinking glass so that such gas can evolve naturally to rise as minute bubbles within the beverage and the latter retains a "sparkle" which is considered desirable aesthetically and can add to the consumer's enjoyment and "mouth feel" of the beverage. It is an object of the present invention to provide a beverage package of the kind generally discussed which alleviates the aforementioned disadvantage of excessive liberation of gas in solution so that the beverage when dispensed will retain a desirable "sparkle" without detracting from the desirable characteristics required for froth development in forming a head on the beverage.

STATEMENT OF INVENTION & ADVANTAGES

According to the present invention there is provided a beverage package comprising a sealed container having a primary chamber containing beverage having gas in solution therewith and forming a headspace comprising gas at a pressure greater than atmospheric; a secondary chamber containing gas at a pressure greater than atmospheric and which communicates or is capable of communicating with beverage in the primary chamber by way of an aperture submerged in the beverage, said aperture being located in the beverage at a position nearer to the surface of the beverage than to the bottom of the beverage in the primary chamber, and wherein the package is openable to open the primary chamber to atmospheric pressure and said opening creates a pressure differential causing gas under pressure from the secondary chamber to be introduced by way of the aperture into the beverage in the primary chamber for said introduction to liberate gas from solution in the beverage to form froth in the primary headspace and wherein said liberation of gas is restricted to a minor proportion of the volume of beverage in the primary chamber disposed within a minor depth of the beverage from the surface thereof.

Beverage packages are well known, for example as disclosed in our British Patent No. 1,266,351, in which in response to a pressure differential developed on opening of the package, gas under pressure from a secondary chamber is injected into beverage in the primary chamber for the purpose of liberating gas from solution in beverage

in the primary chamber. This ejection is effected from the secondary chamber through an aperture and in the prior proposals such aperture is located at or towards the bottom of the beverage in the primary chamber. As a consequence high energy from the gas injection liberates gas from solution in the beverage initially in the region of the aperture and this seeds the further liberation of gas from the beverage so that a surge of gas bubbles develops and grows rapidly to rise, predominantly, throughout the volume of beverage in the primary chamber. By the present invention the aperture is located in the beverage in the primary chamber nearer to the surface of that beverage than to the bottom of the beverage and as a consequence the aforementioned liberation of gas from solution in the beverage by the rising surge of gas bubbles from the aperture restricts the gas liberation to a minor proportion of the volume of beverage in the container. Typically the minor proportion of beverage from which gas is liberated will be less than 30% of the total volume of beverage within the container. The result of such restricted gas liberation is that a major proportion of the volume of beverage in the container will retain gas in solution - this is particularly so for carbon dioxide. Therefore when the beverage is dispensed from the container into a drinking glass for consumption, gas may continue to evolve from solution to maintain "sparkle" and other characteristics considered desirable for the beverage product.

The secondary chamber may be integral with the container but is preferably formed by a hollow insert located in the primary chamber. The insert will usually be located at or towards the bottom of the primary chamber and in such case it may be provided with an extension that projects upwardly in the beverage to locate the aperture at its submerged position nearer to the surface of the beverage than to the bottom of the beverage in the primary chamber. Usually the insert will be formed of plastics having a base part which carries a tubular extension projecting upwardly within the beverage so that the base part and tubular extension together form the secondary chamber and the aperture can be located at or towards the top of the tubular extension. Conveniently the base part of the insert is located within the container through an open top thereof during formation of the beverage package and subsequently the extension part can be fitted and sealed to the base part within the primary chamber. The aperture of the insert is likely to be restricted sufficiently to alleviate flow of beverage from the primary chamber into the secondary chamber when the contents of the sealed package are in equilibrium. However, in a preferred insert structure the aperture has a non-return valve associated therewith which restrains entry of beverage into the secondary chamber and which is responsive to the pressure differential (developed when the package is opened to open the primary headspace to atmospheric pressure) to permit the injection of gas under pressure from the secondary chamber into the upper region of beverage in the primary chamber for froth development. The latter form of insert may be received within an open topped container during formation of the package with the aperture closed so that the secondary chamber is sealed and contains gas at a pressure greater than atmospheric; following charging of the container with its beverage and subsequent sealing of the container, the sealed package may be processed (for example as a result of the package being heated for pasteurising the beverage, so that the structure of the insert is modified, for example by thermal distortion of plastics material from which the insert is formed) to ensure that when the sealed package is opened and the pressure differential applied, communication is effected, possibly by way of a known non-return valve in the insert, between the secondary chamber and the beverage in the primary chamber.

DRAWING

One embodiment of a beverage package constructed in accordance with the present invention will now be described, by way of example only, with reference to the accompanying illustrative drawing, which shows a section through the package.

DETAILED DESCRIPTION OF DRAWING

The beverage package illustrated comprises a conventional form of container such as a light metal can 1 having an externally concave circular base 2 on which the package will normally stand, a cylindrical side wall 3 and a circular top 4 which will usually be seamed to the side wall 3 to seal the container. The top 4 will be openable, typically by a ring pull, displaceable tab or other conventional means for the purpose of dispensing beverage contents of the container.

In the present example, the beverage for the package may be considered as a light beer or lager having in solution a mixture of carbon dioxide and nitrogen gases, typically the carbon dioxide content will be 1.25 to 6.0 gramms per litre and the nitrogen gas content will be 3% to 5% vols./vol. The term "vols./vol." is well known in the art but a definition of it may be found in our British Patent No. 1,588,624. The container 1 forms a primary chamber 5 and prior to fitting and sealing the top 4 and with the container in an upstanding condition, an insert 6 is inserted into the primary chamber

through the open top of the container and located on the base 2 at the bottom of the primary chamber 5.

The insert 6 is conveniently assembled from plastics mouldings to have a hollow generally cylindrical drum part 7 from which extend diametrically opposed flanges 8 and a tubular extension part 9 which projects upwardly from the drum part 7 towards the open top of the container. The insert 6 is fitted within the container so that the flanges 8 frictionally engage with the cylindrical side walls 3 to retain the insert at the bottom of the primary chamber. It will be appreciated however that alternative means of retaining the insert 6 at the bottom of the container may be provided, for example by suction or magnetically. The hollow drum part 7 and extension part 9 of the insert form a secondary chamber 10 which is to communicate with the primary chamber 5 by way of an aperture or port 11 at the upper end of the extension part 9.

The secondary chamber 10 contains gas, usually nitrogen, at a pressure greater than atmospheric. Pressurisation of the secondary chamber 10 may be effected in either of two ways as will be discussed hereinafter.

After the insert 6 has been fitted within the open topped container, the primary chamber 5 is charged with the beverage 20 containing gas in solution and thereafter the container is closed and sealed by the top 4 so that a primary headspace 21 in the primary chamber of the container is at a pressure greater than atmospheric. Pressurisation of the headspace 21 may be achieved in conventional manner, for example by dosing the primary chamber with liquid nitrogen immediately prior to the top 4 being fitted and sealed. In the sealed package and as will be seen from the drawing, the aperture 11 is submerged in the beverage 5 and is located much nearer to the surface 22 of the beverage than it is to the bottom of the primary chamber 5; in practice the aperture 11 is likely to be submerged to a depth at which approximately 10% to 20% of the volume of beverage 20 in the primary chamber is located above that aperture.

When the sealed package is opened, for example by a ring pull (not shown) in the top 4 to dispense the beer 20, the primary headspace 21 is opened to atmospheric pressure and rapidly depressurises. As a consequence, a pressure differential is developed whereby the pressure of gas in the secondary chamber 22 exceeds the pressure in the headspace 21. This causes the gas in the secondary chamber 10 to be injected through the aperture 11 into the beer 20. As a consequence of this injection, and in a manner well known in the art, gas is liberated from solution in the beverage 20 to provide a surge of gas bubbles which develops, predominantly, throughout the beverage 20 above the aperture 11 and rises to develop froth in the headspace 21. By locating the aperture 11 at a relatively shallow depth beneath the surface 22 of the beverage 20, gas from solution, particularly carbon dioxide, is liberated to form froth in the headspace 21 from a minor proportion, say less than 20%, of the total volume of beer 20 in the container. Therefore when the beer 20 is poured from the container into a drinking glass shortly after opening the can, the froth developed by the evolution of gas from part only of the beverage may provide a desirable head on the beer in the glass. However, adequate gas is maintained in solution in the beer in the glass for such gas to evolve gradually and naturally and present a slight effervescent effect or "sparkle" to the body of the beer - this is considered most desirable for aesthetic quality in lager or light beer and may also enhance the flavour characteristics and mouth feel of the beer.

Gas under pressure may be provided in the secondary chamber 10 where that secondary chamber is in constant communication by way of the aperture 11 with the primary chamber 5 by locating and maintaining the insert 6 in the open topped container in a gas environment where the pressure is greater than atmospheric and this environment is maintained to pressurise the secondary chamber during charging of the primary chamber with beverage and sealing the open top of the container. With this technique the aperture 11 should form a restriction which ensures that any beer which may flow from the primary chamber through the restricted aperture 11 into the secondary chamber 10 (during charging of the container with beverage, during the period in which the contents of the sealed package come into equilibrium, and during general handling and storage of the sealed package) is negligible. With such a proposal in which the secondary chamber 10 is pressurised within the open topped container and prior to charging the container with beer 20, the insert 6 may, for ease of mechanical handling, be assembled within the open topped container by first fitting the base part 7 of the insert within the container and subsequently fitting and sealing the extension part 9 to the base part 7 within the container. As an alternative possibility the insert 6 as received by the primary chamber 5 may have its secondary chamber 10 sealed and containing gas, typically nitrogen gas, at a pressure greater than atmospheric. With this latter proposal the port 11 will initially be closed but arranged to open, following charging of the primary chamber 5 with beer 20 and subsequent pressurisation of the headspace 21 and sealing of the container with the top 4, by appropriate processing of the sealed package. For example, the sealed package may be subjected to heat during pasteurisation of the beverage 20 and

such heat may cause a change in the characteristics of the plastics material of the extension part 9 which results in automatic opening of the port 11. A further possibility for this latter technique where the insert 6 as received by the open topped container has its secondary chamber 10 sealed and containing gas under pressure, is for the port 11 to be closed by the upper end of a projection indicated at 30 extending upwardly within the extension part 9, conveniently projecting from a bottom wall of the drum part 7. The projection 30 closes the port 11 to seal the secondary chamber 10 throughout the period during which the container is charged with beverage and sealed. However, during subsequent processing of the sealed package, for example by subjecting the package to heat as aforementioned, the characteristics of the plastics insert 6 change to the extent that the free end of the projection 30 co-operates with the port 11 to form a non-return valve which is responsive to the pressure differential developed between the pressure of gas in the secondary chamber 10 and that in the headspace 21 (when the top 4 is opened to open the headspace to atmospheric pressure). The non-return valve presented by the projection 30 and port 11 normally restrains beer from entering the secondary chamber 10 through the port 11. On opening of the container the plastics material of the extension part 9 (or insert generally) may flex in response to the pressure differential that is developed and relative to the projection 30 so that gas under pressure is injected from the secondary chamber 10 through the port 11 into the upper region of the beer 20 in the primary chamber 5 for froth development.

Although in the drawing the aperture 11 is shown as being directed towards the surface 22 of the beer 20 it will be appreciated that this aperture may be arranged to provide the gas injection into the beer in any direction as preferred and probably depending upon the depth at which the port 11 is submerged within the beer 5, for example where the aperture 11 is located immediately below the surface 22 of the beer 20 it is likely that the port 11 will be arranged to inject gas towards the cylindrical side wall of the container or even downwardly into the beverage to alleviate loss of energy from the gas injection into the headspace 21.

Claims

1. A beverage package comprising a sealed container having a primary chamber containing beverage having gas in solution therewith and forming a headspace comprising gas at a pressure greater than atmospheric; a secondary chamber containing gas at a pressure greater than atmospheric and which communicates or is capable of communicating with beverage in the primary chamber by way of an aperture submerged in the beverage, said aperture being located in the beverage at a position nearer to the surface of the beverage than to the bottom of the beverage in the primary chamber, and wherein the package is openable to open the primary chamber to atmospheric pressure and said opening creates a pressure differential causing gas under pressure from the secondary chamber to be introduced by way of the aperture into the beverage in the primary chamber for said introduction to liberate gas from solution in the beverage to form froth in the primary headspace and wherein said liberation of gas is restricted to a minor proportion of the volume of beverage in the primary chamber disposed within a minor depth of the beverage from the surface thereof.

2. A package as claimed in claim 1 in which said minor proportion of beverage is less than 30% of the beverage in the primary chamber.

3. A package as claimed in claim 2 in which said minor proportion of beverage is less than 20% of the beverage in the primary chamber.

4. A package as claimed in any one of the preceding claims in which the secondary chamber is formed by a hollow insert located in the primary chamber.

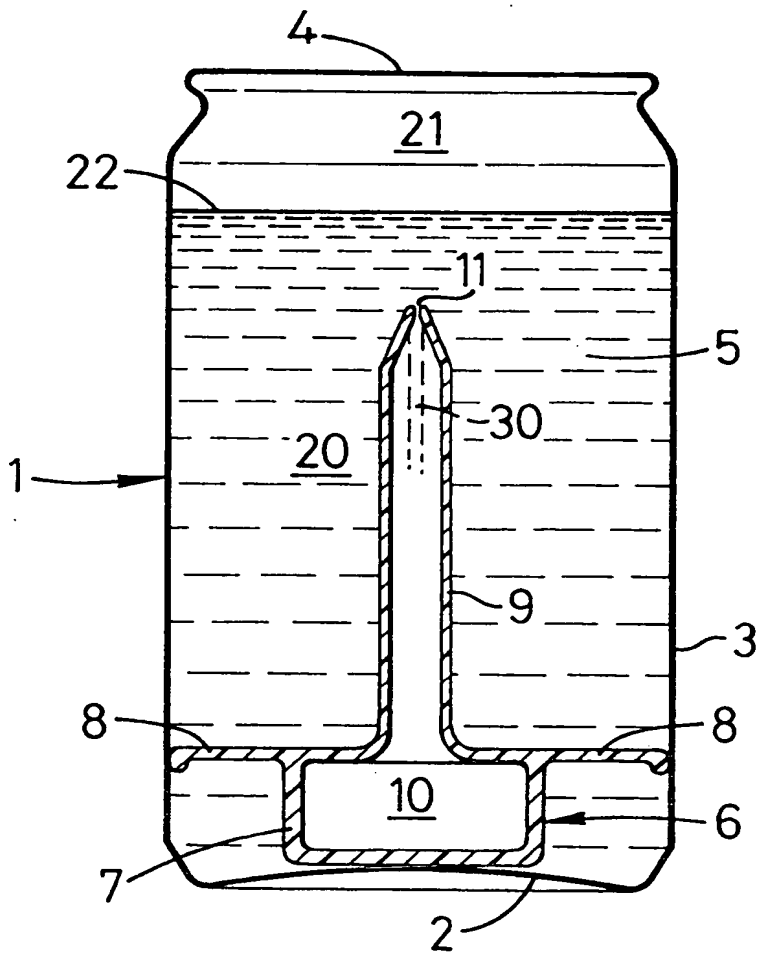
5. A package as claimed in claim 4 in which the insert is located at or towards the bottom of the primary chamber and is provided with an extension that projects upwardly in the beverage to locate the aperture in its submerged position nearer to the surface of the beverage than to the bottom of the beverage in the primary chamber.

6. A package as claimed in claim 5 in which the insert comprises a base part carrying a tubular extension that projects upwardly within the beverage, said base part and tubular extension together forming the secondary chamber and said aperture being located on the tubular extension.

7. A package as claimed in any one of the preceding claims in which the aperture has a non-return valve associated therewith which restrains entry of the beverage into the secondary chamber through said aperture and which valve is responsive to said pressure differential to permit the injection of gas under pressure from the secondary chamber into the beverage

in the primary chamber.

8. A package as claimed in any one of the preceding claims in which said aperture is disposed to direct the injection of gas from the secondary chamber upwardly into the beverage in the primary chamber.



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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 8516

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
P,A	EP-A-0 520 602 (GUINNESS) *Whole document*	1-8	B65D79/00
A,D	GB-A-1 266 351 (GUINNESS) * claims 1-12; figures 1-4 *	1	
A	EP-A-0 227 213 (GUINNESS) * claims 1-11; figures 1-5 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 February 1994	Bessy, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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